



Installation Practice

Rehabilitation of a Sewer Service Lateral Pipe

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Installation Practice for Rehabilitation of a Sewer Service Lateral Pipe

Using Cured-In-Place Pipe By Means Of Air Inversion

1. Intent

It is the intent of this specification to provide materials and a standard practice for installing a cured-in-place pipe to renew a sewer service lateral that connects to a main pipe or directly to a manhole.

2. General

- 2.1 The service lateral reconstruction shall be accomplished using a translucent inversion bladder, a non-woven fabric tube of particular length that includes a *compression gasket seal* at each end of the tube, and a thermo-set resin with physical/chemical properties appropriate for the application. The *tube* is positioned inside of a *translucent inversion bladder* forming a *liner/bladder assembly*. The tube shall be resin impregnated under a controlled vacuum within *the translucent bladder*. The liner/bladder assembly is then inserted into a *mobile air-inversion device*. The mobile air-inversion device shall include a *camera port* for inspecting the resin saturated tube inflated in the pipe before the resin is cured, and for visually verifying the liner has been fully deployed and the end is open. Access to an upstream end of the service lateral is accomplished by using an existing clean out or by making a small vacuum excavation.
- 2.2 The mobile air-inversion device is aligned with the access opening in the service lateral pipe (manhole, excavated pit, inside clean out or outside clean out). When the mobile air-inversion device is properly positioned, the liner/bladder assembly is inverted into the lateral pipe under *controlled air pressure*. The liner/bladder assembly shall include a hold back rope for controlling the speed of inversion and protecting plumbing fixture traps in the building by ensuring a positive pressure is not created in the service lateral pipe. The inversion is complete when the liner is fully extended within the lateral pipe, and the bladder extending beyond the open end of the liner tube, with the compression gasket positioned between the host pipe and the liner.
- 2.3 A lateral camera shall be inserted into a *camera port* and continuing through the bladder, under pressure providing visual inspection of the inflated liner tube prior to curing the resin. The inspection process shall verify that the liner is properly positioned in the pipe and the tube has been fully deployed with the end open. The resin impregnated tube is cured, the inflation bladder reverted from the cured tube, and the mobile launching device is removed.



3. Material

- 3.1 Tube - The fabric tube shall consist of flexible needle punched felt, knitted tube or an equivalent non-woven material. The tube may be reinforced by incorporating scrim or fiberglass strands to limit length stretch and improve structural properties. The tube shall be a butt seam constructed by longitudinal stitching and thermal tape seal bonding producing a uniform wall thickness with no intermediate layers. The tube shall be capable of conforming to bends, offset joints, bells, and disfigured pipe sections. A hydrophilic O-ring shall be positioned at each end of the liner tube providing a leak-free compression gasket seal compatible with all piping materials.
- 3.3 The bladder shall be translucent to enable visual inspection of resin during saturation under a controlled vacuum and inspection of the liner once inflated in the pipe prior to curing of the resin.
- 3.4 Liner/Bladder Assembly - The tube positioned within the translucent bladder shall form a liner/bladder assembly engineered for inserting the liner tube and bladder simultaneously from a single access point maintaining inflation pressure from the initial inversion of the liner tube until the resin is cured.
- 3.5 Resin - The thermo-set resin system shall be polyester, vinyl ester, silicate or epoxy with proper catalysts as designed for the specific application.
- 3.6 Design Considerations - The design of the cured-in-place lateral liner system is largely a function of the condition of the existing pipeline and the loads stipulated by the customer's specification. Structural strength design calculations as per ASTM F1216, appendix X1.1.2

Minimum Structural Properties

Flexural Strength (ASTM D790) = 4,500 psi

Flexural Modulus (ASTM D790) = 250,000 psi

Chemical Resistance

The cured tube shall meet minimum tests standards described in ASTM F1216, appendix X2.

4. Installation Recommendations

ASTM F1216: Standard Practice for the Installation of Cured In-Place Pipe by Inversion Lining

- 4.1 Accessing the Pipe – Should a cleanout not exist; the lateral does not directly connect to a manhole, then the Installer shall excavate an access pit, or install a cleanout providing access to the lateral pipe.
- 4.2 Cleaning and Inspection – All roots and debris shall be removed from the pipe and a CCTV inspection shall be performed documenting length, diameter and pipe defects as per NASSCO Standards.
- 4.3 The tube is cut to the appropriate length and inserted within the translucent bladder.
- 4.4 Resin Impregnated Tube – The tube in good condition shall be resin impregnated under a controlled vacuum with the appropriate thermo-set resin designed for the pipe and its intended use. All resin shall be contained within the translucent bladder during vacuum impregnation. The Installer shall ensure that no public property is exposed to contamination by liquid resin compounds or components.



- 4.5 Liner Insertion – The resin impregnated tube within the inflation bladder is inserted into the mobile launching device and positioned at the clean out, or pipe opening.
 - 4.6 Inversion – The liner/bladder assembly is inverted out of the mobile launching device by controlled air pressure. Once the liner tube begins to invert, the tail of the tube progresses as the tube is pressed against the pipe wall. At no time shall the air pressure be removed causing interruption to inflation and pressing of the tube. The inversion shall be complete when the tube is fully deployed and the bladder is extending beyond the liner tube keeping the end of the liner open. The tube is held tightly in place against the wall of the host pipe under pressure until the cure is complete in accordance with **ASTM F1216 Sections 7.4.2 and 7.4.3: Using Air Pressure**. The inversion air pressure should be adjusted to be of sufficient pressure to cause the impregnated tube to invert from point of inversion to point of termination and hold the tube tight to the pipe wall, producing dimples at side connections. Care should be taken during the inversion so as not to overstress the woven and nonwoven materials.
 - 4.7 Curing – The liner is chemically cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to uniformly raise the temperature above the temperature required to cure the resin. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions. The heat source temperatures shall be monitored and logged during the cure and cool down cycles. The manufacturer’s recommended cure schedule shall be submitted.
 - 4.8 CIPP Processing – Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer’s recommendations.
The bladder is reverted back into the launching device and removed from the manhole, cleanout or access pit. No barriers, coatings, or any material other than the cured tube/resin composite is to be left in the host pipe. The liner shall be leak-free with each end sealed to the host pipe by means of swelling compression gaskets.
 - 4.9 Trimming – Any tube protruding into the main pipe shall be robotically trimmed flush.
 - 4.10 Post Inspection – A second CCTV inspection is performed documenting liner placement and condition. The owner shall receive a video recording and a written report certified by NASSCO LACP documenting inspection of the CIPP.
 - 4.11 Reinstatement of Service – Any side connections shall be reinstated and returned to service, unless otherwise directed by the owner.
5. Clean-Up
The site shall be left clean and the property returned to original condition.
 6. Payment
Payment for the work shall be in accordance with the prices as set forth in the proposal for the scope of work performed.



- 6.1 Mobilization/ lump sum
- 6.2 Lateral Cleaning/Video Inspection from a cleanout or a manhole/ per foot
- 6.3 Installation of an outside cleanout/ lump sum.
- 6.3 Lateral Lining Set-up/ lump sum.
- 6.4 Rehabilitation of the Lateral Pipe by CIPP Lining/ per lineal foot.



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TEST REPORT

Send To: C0079377

Matthew Hennick
LMK Technologies, LLC
1779 Chessie Lane
Ottawa, IL 61350

Facility: C0079378

LMK Technologies, LLC
1779 Chessie Lane
Ottawa IL 61350
United States

| Result | PASS | Report Date | 03-OCT-2023 |
|-------------------|--|-------------|-------------|
| Customer Name | LMK Technologies, LLC | | |
| Tested To | ASTM F1216-2022 - per NSF/ANSI 14 | | |
| Description | LMK Technologies Performance Liner Lateral Lining System | | |
| Trade Designation | LMK Technologies | | |
| Test Type | Annual Collection | | |
| Job Number | A-00449121 | | |
| Project Number | W0810167 | | |
| Project Manager | Maryam Arghandeh | | |

Thank you for having your product tested by NSF.

Please contact your Project Manager if you have any questions or concerns pertaining to this report.

Report Authorization

Brian Gruber

Date 03-OCT-2023

Brian Gruber - Manager, Physical Test Lab

FI20231003114102

A-00449121

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Summary of Test Results

Family Code 01
Physical Description of Sample Pipe Liner
Primary DCC Number PM15779
Test Description ANNUAL PERFORMANCE TESTING
Trade Designation/Model Number LMK Technologies

| Test Description | Result |
|---------------------------|--------|
| Flex Modulus Test | Pass |
| Flexural Strength Test | Pass |
| Gravity Pipe Leakage Test | Pass |



P3084 - Gravity Pipe Leakage Test

| | | |
|-----------------------------------|----------------|------------|
| Sample Description | Pipe Liner | |
| Test Location | NSF Willow Run | |
| Initial water column | 2 | feet |
| Final water column | 2 | feet |
| Allowable Leakage | 29.90 | mL |
| Actual Leakage | 0 | mL |
| Test Duration | 61 | minutes |
| Actual leakage rate | 0 | g/in/mile/ |
| Gravity Pipe Leakage Test: | Pass | |

P3122 - Flex Modulus

| | | |
|--|-----------|-----------|
| Specimens conditioned for | >40 | hours |
| Specimens conditioned at | 73 | degrees F |
| Relative humidity | 50 | % |
| Test temperature Required | 73 | degrees F |
| Test temperature Actual | 73 | degrees F |
| Actual Average Modulus | 447000 | psi |
| Flex Modulus Test | Pass | |
| Test Location – NSF HQ, Ann Arbor | Ann Arbor | |

| Test Results | Flex Modulus (psi) |
|--------------|--------------------|
| Required | 250000 |
| Specimen 1 | 437000 |
| Specimen 2 | 465000 |
| Specimen 3 | 483000 |
| Specimen 4 | 419000 |
| Specimen 5 | 428000 |



P3123 - Flexural Strength Test

Specimens conditioned for >40 hours
 Specimens conditioned at 73 degrees F
 Relative Humidity 50 percent
 Required Test Temperature 73 degrees F
 Actual Test Temperature 73 degrees F
 Average Flexural Strength 9060 psi
 Flexural Strength Test Pass
 Test Location – NSF HQ, Ann Arbor Ann Arbor

| Test Results | Flexural Strength (psi) |
|--------------|-------------------------|
| Required | 4500 |
| Specimen 1 | 8830 |
| Specimen 2 | 9360 |
| Specimen 3 | 9900 |
| Specimen 4 | 8140 |
| Specimen 5 | 9070 |

P3172 - Specimen Fabrication

Test Location – NSF HQ, Ann Arbor NSF Ann Arbor
 Specimen Fabrication COMPLETE
 Time 2 hours

Test Notes:

Samples were cut from pipe liner.



Testing Laboratories:

| | Flag | Id | Address |
|--|------|--------|---|
| All work performed at: (Unless otherwise specified) | → | NSF_WR | NSF Willow Run 251 Airport Industrial Drive Ypsilanti, MI 48198 |

References to Testing Procedures:

| NSF Reference | Parameter / Test Description |
|---------------|------------------------------|
| P3084 | Gravity Pipe Leakage Test |
| P3122 | Flex Modulus |
| P3123 | Flexural Strength Test |
| P3172 | Specimen Fabrication |

Test descriptions preceded by an asterisk "*" indicate that testing has been performed per NSF requirements but is not within its scope of accreditation.

Unless otherwise indicated, method uncertainties are not applied in any determinations of conformity. Testing utilizes the requested sections of any referenced standards, which may not be the entire standard.

Dates of Laboratory Activity: 20-SEP-2023 to 03-OCT-2023



IAPMO RESEARCH AND TESTING, INC.

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CERTIFICATE OF LISTING



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Issued To:

LMK TECHNOLOGIES, LLC

1779 CHESSIE LANE OTTAWA, IL 61350 . United States

Product:

Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

Products are certified to the following standard(s)

ASTM F1216-2016

File Number: 9581

Revised Date: August 2, 2023

Effective Date: November 2019

Void After: November 2024*


Chairman, Product Certification Committee




Chief Technical Service Officer

*This certificate is not evidence of current listing. To verify listing status, visit the IAPMO R&T Product Listing Directory at pld.iapmo.org

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CERTIFICATE OF LISTING



Issued To: LMK TECHNOLOGIES, LLC

Effective Date: November 2019

File Number: 9581

Revised Date: August 2, 2023

Product: Rehabilitation of Existing Pipelines and Conduits by the
Inversion and Curing of a Resin-Impregnated Tube

Void After: November 2024

This certificate is not evidence of current listing. To verify listing status, visit the IAPMO R&T Product Listing Directory at pld.iapmo.org

Identification:

Manufacturer's name or trademark, model description of woven or nonwoven material and associated thermosetting resin and shall bear the UPC® certification mark.

Characteristics:

Materials for the reconstruction of pipeline and conduits (3" to 108") by the installation of a resin impregnated flexible tube which is inserted into the existing conduit by use of a hydrostatic head of air pressure. For replacement of existing sewers only. To be installed in accordance with the requirements of the manufacturer's installation instructions and the latest edition of the Uniform Plumbing Code.

Products listed on this certificate have been tested by an IAPMO R&T recognized laboratory. This recognition has been granted based upon the laboratory's compliance to the applicable requirements of ISO/IEC 17025.



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Models

| Model Number | Description |
|--|------------------------------------|
| Performance Liner® Lateral Lining System | For use with pipe in sizes 4" - 8" |